ABSTRACT OF THE INVENTION

A hydrogen purification system and method that utilizes a hydrogen separator with a novel composite structure. The hydrogen separator has a first porous layer of a hydrogen permeable material, such as a palladium alloy. A solid layer of the same hydrogen permeable material is then disposed onto the first porous layer. A pressure differential is created across the structure of the composite hydrogen separator. The porous layer of hydrogen permeable material supports the solid layer and enables the solid layer to withstand large pressure differentials. Furthermore, the porous layer of the hydrogen permeable material bonds to the solid layer, thereby greatly increasing the effective surface area of the solid layer that is exposed to hydrogen gas. Accordingly, a large flow rate of hydrogen gas can be obtained in a small amount of space.